

Challenges and Requirements of Proper Operation for Compressor Anti-Surge Valves

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Abstract

Anti-Surge valves are used in plants all over the world primarily to prevent a compressor from going into a "Surge" condition. Surge occurs when the discharge pressure exceeds the suction pressure and flow reverses. This flow reversal may cause catastrophic damage to the compressor which in turn can further damage other equipment and possibly shut-down the unit or the plant. Therefore, in order to catch the Surge condition and before flow begins to reverse, the compressor control system's elaborate algorithms will control the Anti-Surge valve to open as fast as possible and recycle the flow to the suction side of the compressor, hence eliminating Surge. Pneumatic actuators have been traditionally used for many years and while many improvements have been made to enhance their performance, primarily by adding ancillary equipment like Volume Boosters and Quick Exhausts, they are plagued by the inherent compressible nature of air. Because of air's compressible nature, pneumatic actuators tend to be slower and they will overshoot or undershoot as compared to Electro-Hydraulic actuators. The motive force behind an electro-hydraulic actuator is hydraulic, which being that it is a liquid, is an incompressible fluid. The incompressible nature of hydraulics allows it to be stronger, stiffer, faster and more precise in actuation. Electro-Hydraulics also have the added benefit of providing accurate, precise and repeatable control with no overshoot. Other benefits include not having to rely on Instrument Air Supply which can be faulty due to "air starvation" or also moisture in the tubing which can lead to condensation and create other faults. Yet other benefits include doing away with ancillary equipment such as Volume Booster, Quick Exhausts and Volume Tanks all of which will eventually fail over time. When a process disturbance calls for an emergency trip or quick open situation, electro-hydraulic technology can open/close in milliseconds, whereas a pneumatic actuator can take up to 2 seconds or more. This means that the end-user will be able to stabilize his process a lot faster. Furthermore, the precision allows the client to operate in much larger or expanded parameters since the speed of response will be faster and the precision will allow for tighter control. In addition, if the anti-surge valve is designed with a large rangeability, pneumatic actuators are a poor choice due to their lack of control under 10% open or above 90% open. A side-to-side comparison of pneumatics vs electro-hydraulic

actuators will be shown, to prove that electro-hydraulics improve the operation, efficiency, safety and reliability of compressor operation.